

WHAT IS CLAIMED IS:

1. An extruded thermoplastic polyurethane composition having a high crystalline content comprising the reaction product of:

5 a polyol component, wherein said polyol component has a number average molecular weight of about 500 to about 10,000 per polyol;

a polyisocyanate component;

10 a chain extender component, wherein said chain extender component is an unbranched, unsubstituted, straight chain diol;

a crystallization retarding component, wherein said crystallization retarding component is a diol which is branched, substituted or contains at least one heteroatom, or a combination thereof, wherein if said diol contains an aromatic group there is no trans-trans-isomers; and

15 optionally, a polyurethane catalyst;

wherein said composition has been extruded, and wherein said composition has a hard segment content of at least 20%.

20 2. A composition according to claim 1, wherein the crystallization retarding component is utilized in an amount so that the hydroxyl group content is from about 1 to about 15 equivalents per 100 equivalents of the total hydroxyl groups of the polyol component, the chain extender component and the crystallization

25 retarding component.

3. A composition according to claim 1, wherein said crystallization retarding component is dipropylene glycol, tripropylene glycol, diethylene glycol, triethylene glycol, neopentyl glycol, 1,3-butane diol, 2-methyl-2,4-pentane diol, or a combination thereof.

35 4. A composition according to claim 2, wherein said polyol component comprises hydroxyl terminated polyesters, hydroxyl terminated polyethers, hydroxyl terminated polycarbonates,

hydroxyl terminated polycaprolactams, hydroxyl terminated polyolefins, hydroxyl terminated polyacrylates, or a combination thereof, and wherein said polyol component is utilized in an amount so that the hydroxyl group content is generally from about 2 to about 70 equivalents per 100 equivalents of the total hydroxyl groups present in the composition.

5. A composition according to claim 2, wherein said polyisocyanate component comprises diphenylmethane-4,4'-diisocyanate.

6. A composition according to claim 2, wherein the equivalent weight ratio of polyisocyanate functional groups to total hydroxyl functional groups of the polyol component crystallization retarding component and the chain extender component is from about 0.90 to about 1.10.

7. A composition according to claim 1, wherein said composition has a hard segment content of about 30% to about 90%.

8. A composition according to claim 2, wherein the crystallization retarding component is utilized in an amount so that the hydroxyl group content is from about 2 to about 12 equivalents per 100 equivalents of the total hydroxyl groups of the polyol component, the chain extender component and the crystallization retarding component.

9. A composition according to claim 3, wherein said crystallization retarding component is dipropylene glycol.

10. A composition according to claim 4, wherein said chain extender component is 1,4'-butanediol, ethylene glycol, 1,6-hexanediol, 1,4'-cyclohexanedimethanol, 1,3'-propanediol, and 1,5'-pentanediol, or combinations thereof.

11. A composition according to claim 1, wherein said catalyst is present and comprises stannous octoate, dibutyltin dioctoate, dibutyltin diluarate, bismuth octoate, or a combination thereof.

12. A composition according to claim 1, wherein said composition has been extruded into a membrane, breathable film, sheet, tubing, wire, cable jacketing, shoe sole, hose, or a fiber.

13. An extruded thermoplastic polyurethane composition having a high crystalline content comprising the reaction product of:

a polyol component, wherein said polyol component has a number average molecular weight of about 500 to about 10,000 per polyol;

a polyisocyanate component;

a chain extender component, wherein said chain extender component is an unsubstituted, straight chain diol;

a crystallization retarding component, wherein said crystallization retarding component is a diol which is branched, substituted or contains at least one heteroatom, or a combination thereof, wherein if said diol contains an aromatic group there is no trans-trans-isomers; and

optionally, a polyurethane catalyst;

wherein said composition has been extruded, and wherein said composition has greater than about 4 J/g heat of crystallization exotherm during cool down from melt.

14. A composition according to claim 1, wherein the crystallization retarding component is utilized in an amount so that the hydroxyl group content is from about 1 to about 15 equivalents per 100 equivalents of the total hydroxyl groups of the polyol component, the chain extender component and the crystallization retarding component.

5 15. A composition according to claim 1, wherein said crystallization retarding component is dipropylene glycol, tripropylene glycol, diethylene glycol, triethylene glycol, neopentyl glycol, 1,3-butane diol, 2-methyl-2,4-pentane diol, or a combination thereof.

10 16. A composition according to claim 2, wherein said polyol component comprises hydroxyl terminated polyesters, hydroxyl terminated polyethers, hydroxyl terminated polycarbonates, hydroxyl terminated polycaprolactams, hydroxyl terminated polyolefins, hydroxyl terminated polyacrylates, or a combination thereof, and wherein said polyol component is utilized in an amount so that the hydroxyl group content is generally from about 2 to about 70 equivalents per 100 equivalents of the total hydroxyl groups present in the composition.

20 17. A composition according to claim 2, wherein said polyisocyanate component comprises diphenylmethane-4,4'-diisocyanate.

25 18. A composition according to claim 2, wherein the equivalent weight ratio of polyisocyanate functional groups to total hydroxyl functional groups of the polyol component crystallization retarding component and the chain extender component is from about 0.90 to about 1.10.

30 19. A composition according to claim 1, wherein said composition has about 5 to about 40 J/g heat of crystallization exotherm during cool down from melt.

20. A composition according to claim 2, wherein the crystallization retarding component is utilized in an amount so that the hydroxyl group content is from about 3 to about 12 equivalents per 100 equivalents of the total hydroxyl groups of the polyol

component, the chain extender component and the crystallization retarding component.

5 21. A composition according to claim 3, wherein said crystallization retarding component is dipropylene glycol.

 22. A composition according to claim 4, wherein said chain extender component is 1,4'-butanediol, ethylene glycol, 1,6-hexanediol, 1,4'-cyclohexanedimethanol, 1,3'-propanediol, and 1,5'-pentanediol, or combinations thereof.

 23. A composition according to claim 1, wherein said catalyst is present and comprises stannous octoate, dibutyltin dioctoate, dibutyltin diluarate, bismuth octoate, or a combination thereof.

 24. A composition according to claim 1, wherein said composition has been extruded into a membrane, breathable film, sheet, tubing, wire, cable jacketing, shoe sole, hose, or a fiber.

20 25. A process for preparing a thermoplastic polyurethane having a high crystalline content, comprising the steps of:

 extruding in an extruder a thermoplastic polyurethane composition comprising:

25 a polyol component, wherein said polyol component has a number average molecular weight of about 500 to about 10,000 per polyol;

 a polyisocyanate component;

30 a chain extender component, wherein said chain extender component is an unsubstituted, straight chain diol;

 a crystallization retarding component, wherein said crystallization retarding component is a diol which is branched, substituted or contains at least one heteroatom, or a combination thereof, wherein if said diol contains an aromatic group there is no trans-trans-isomers; and

optionally, a polyurethane catalyst,
wherein said composition has been extruded, and wherein said
composition has a hard segment content of at least 20%.

5 26. A process according to claim 25, wherein the
crystallization retarding component is utilized in an amount so that
the hydroxyl group content is from about 1 to about 15 equivalents
per 100 equivalents of the total hydroxyl groups of the polyol
component, the chain extender component and the crystallization
10 retarding component.

 27. A process according to claim 25, wherein said
crystallization retarding component is dipropylene glycol,
tripropylene glycol, diethylene glycol, triethylene glycol, neopentyl
15 glycol, 1,3-butane diol, 2-methyl-2,4-pentane diol, or a combination
thereof.

 28. A process according to claim 26, wherein said polyol
component comprises hydroxyl terminated polyesters, hydroxyl
20 terminated polyethers, hydroxyl terminated polycarbonates, hydroxyl
terminated polycaprolactams, hydroxyl terminated polyolefins,
hydroxyl terminated polyacrylates, or a combination thereof, and
wherein said polyol component is utilized in an amount so that the
hydroxyl group content is generally from about 2 to about 70
25 equivalents per 100 equivalents of the total hydroxyl groups present
in the composition.

 29. A process according to claim 26, wherein said
polyisocyanate component comprises diphenylmethane-4,4'-
30 diisocyanate.

 30. A process according to claim 26, wherein the
equivalent weight ratio of polyisocyanate functional groups to total
hydroxyl functional groups of the polyol component crystallization

retarding component and the chain extender component is from about 0.90 to about 1.10.

5 31. A process according to claim 25, wherein said composition has a hard segment content of about 30% to about 90%.

10 32. A process according to claim 26, wherein the crystallization retarding component is utilized in an amount so that the hydroxyl group content is from about 2 to about 12 equivalents per 100 equivalents of the total hydroxyl groups of the polyol component, the chain extender component and the crystallization retarding component.

15 33. A process according to claim 27, wherein said crystallization retarding component is dipropylene glycol.

20 34. A process according to claim 28, wherein said chain extender component is 1,4'-butanediol, ethylene glycol, 1,6-hexanediol, 1,4'-cyclohexanedimethanol, 1,3'-propanediol, and 1,5'-pentanediol, or combinations thereof.

25 35. A process according to claim 25, wherein said catalyst is present and comprises stannous octoate, dibutyltin dioctoate, dibutyltin diluarate, bismuth octoate, or a combination thereof.

36. A process according to claim 25, wherein said composition has been extruded into a membrane, breathable film, sheet, tubing, wire, cable jacketing, shoe sole, hose, or a fiber.